



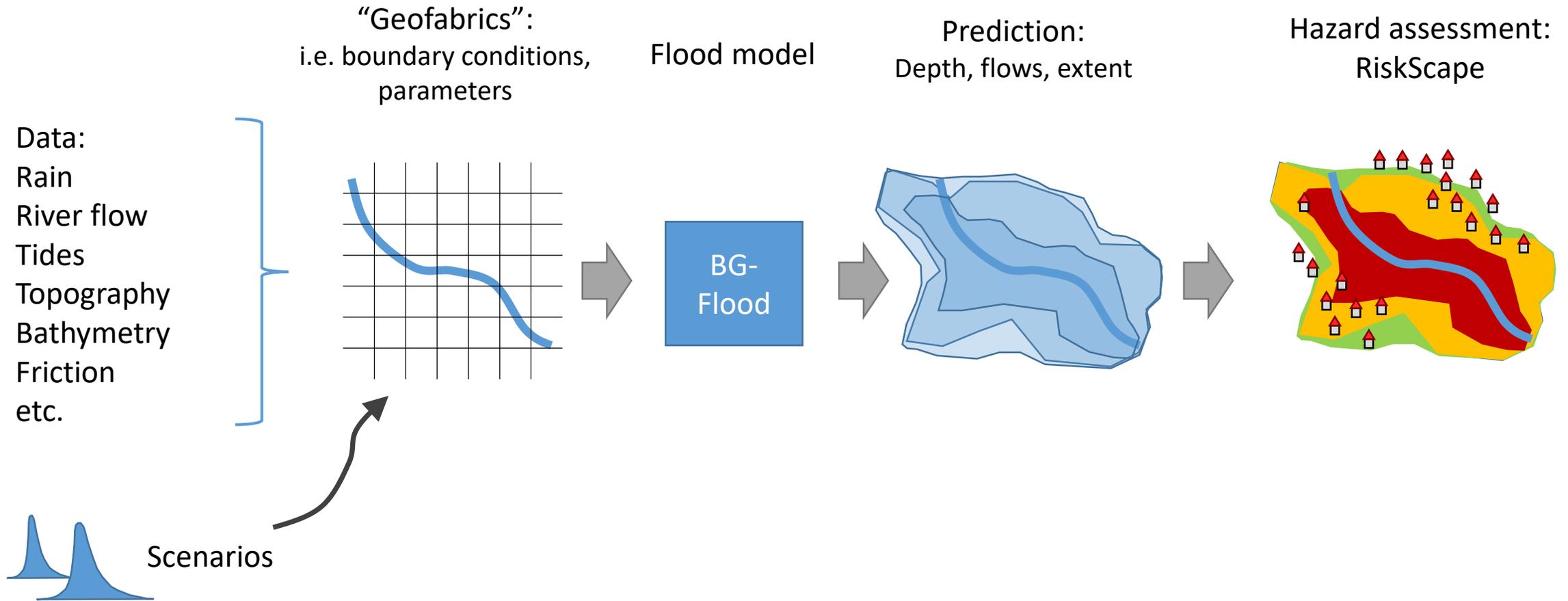
# Uncertainty

Science-Practice roadshow, 2 November 2022, NIWA Christchurch

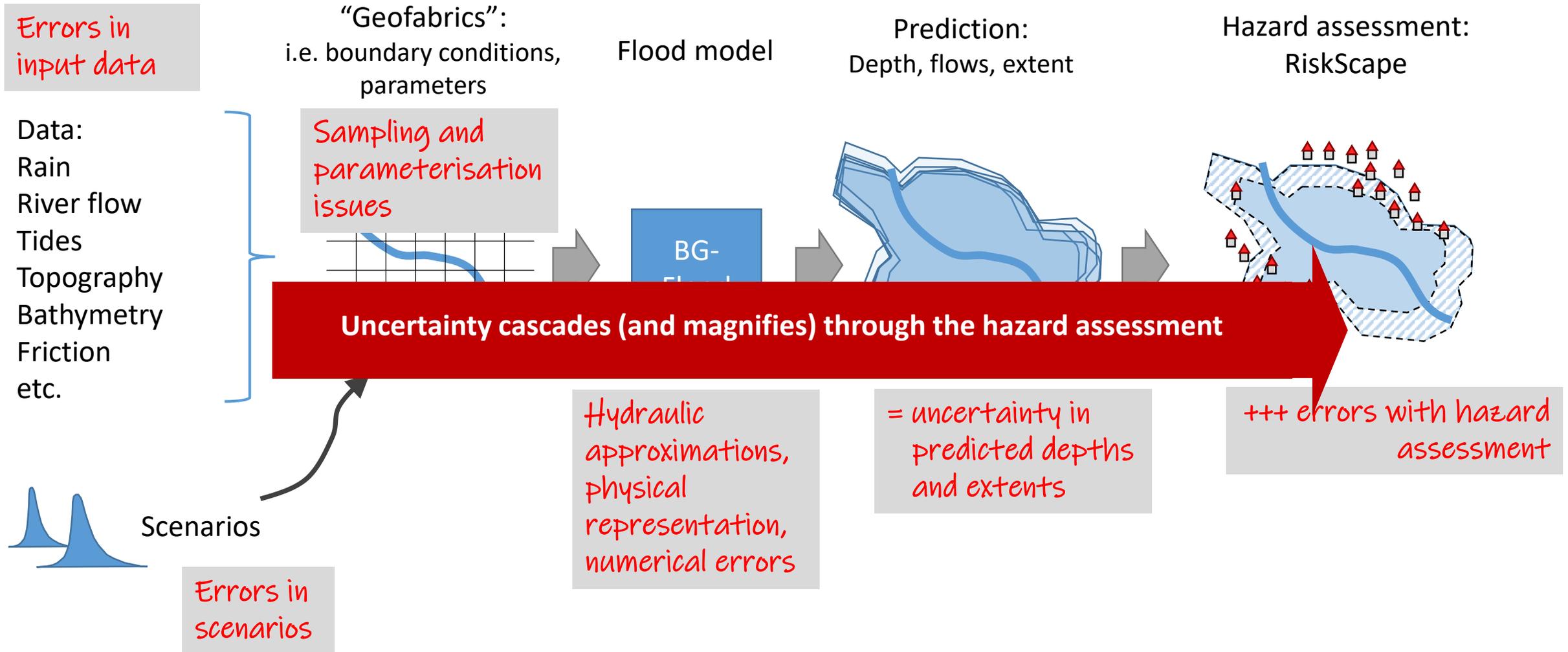
**Te whāriki ō te wai**

Mā te heumarū ō ngā puna wai ō Rākaipahūtū ka ora mo ake tonu

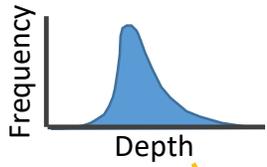
# Assessing flood risk...



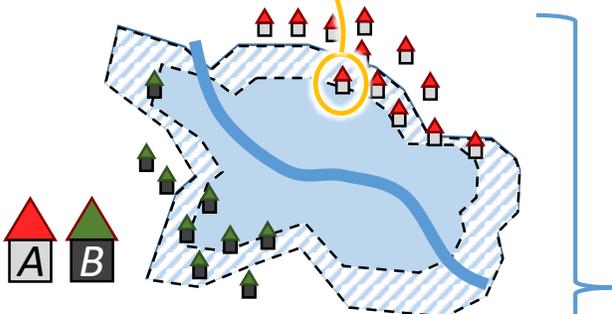
... through a cascade of uncertainty...



... uncertainty which continues through the hazard assessment process:

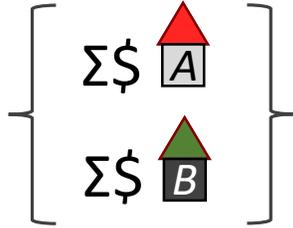
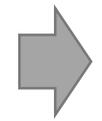


Variability in depth, flows at building level

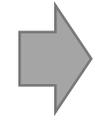
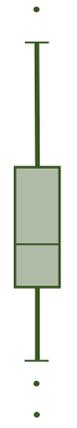


Infrastructure data, e.g.:  
Building footprint, type, construction, floor height

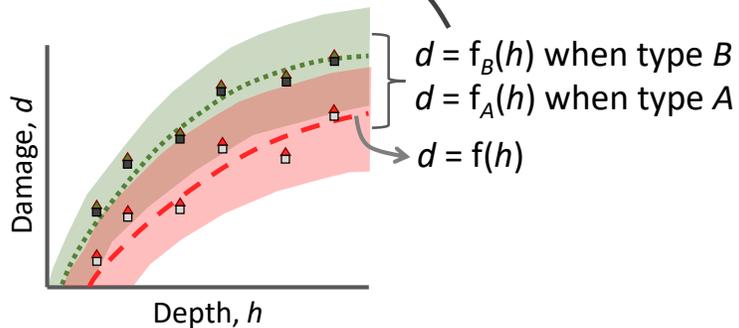
Errors in input data...



= \$



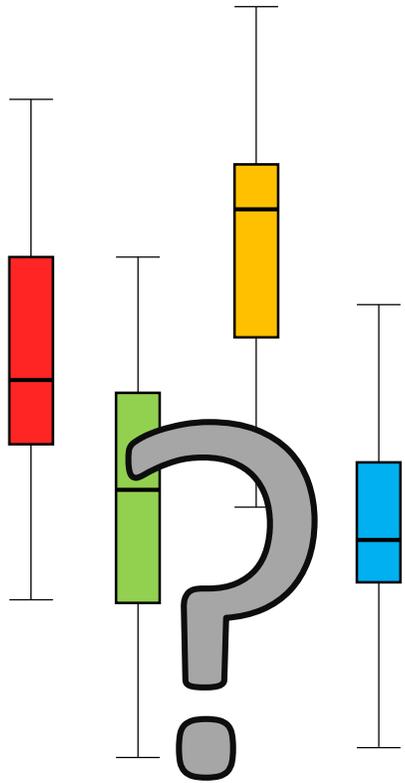
Decision making, e.g., mitigation



Uncertainty in depth/flow-damage relationships

= uncertainty in impact assessment

... leading to decision making and social implications...



Technical uncertainty in flood risk assessment



**What does this mean for me?  
For the outcomes I want?**

**Will it flood again soon?  
Will the next flood be bigger?  
Should I move?**

**Will I get insurance?  
What happens if I can't?**

**Social, economic and political contexts**  
(Uncertainty in everyday decisions)

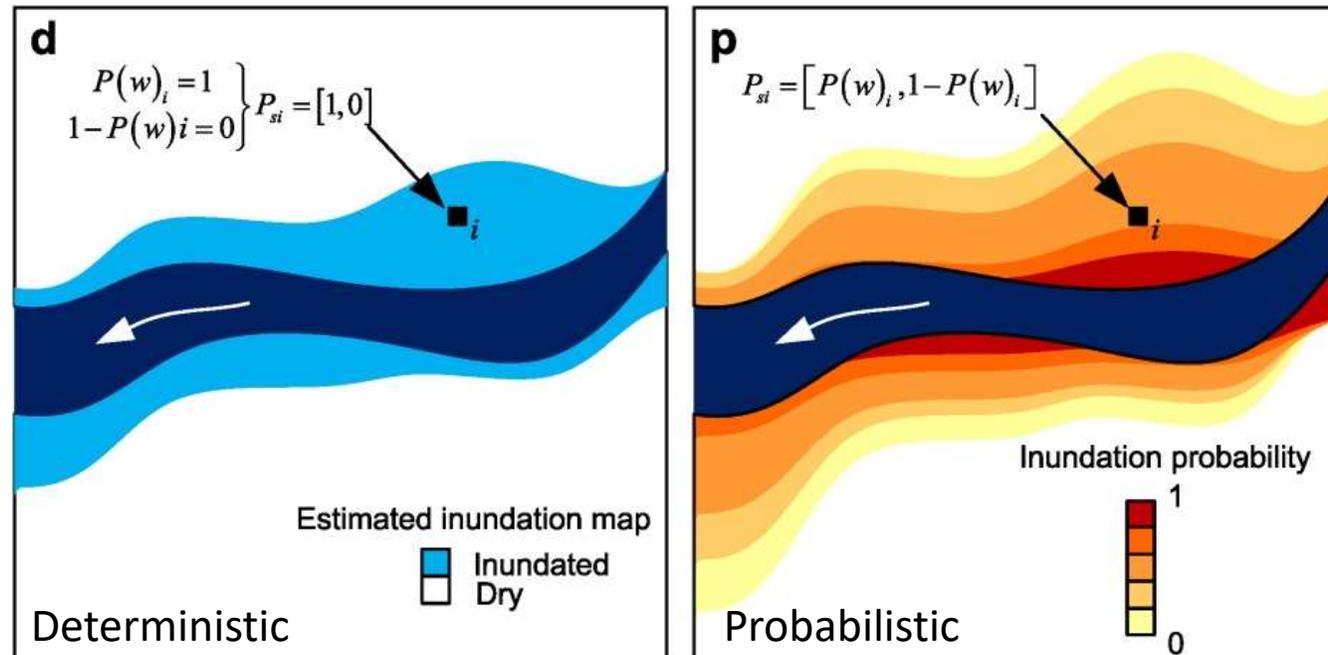
**How will my decision  
be received by others?**

**What will happen if I  
make this choice?**

**Will this action make a difference?**

# How do we communicate risk with uncertainty?

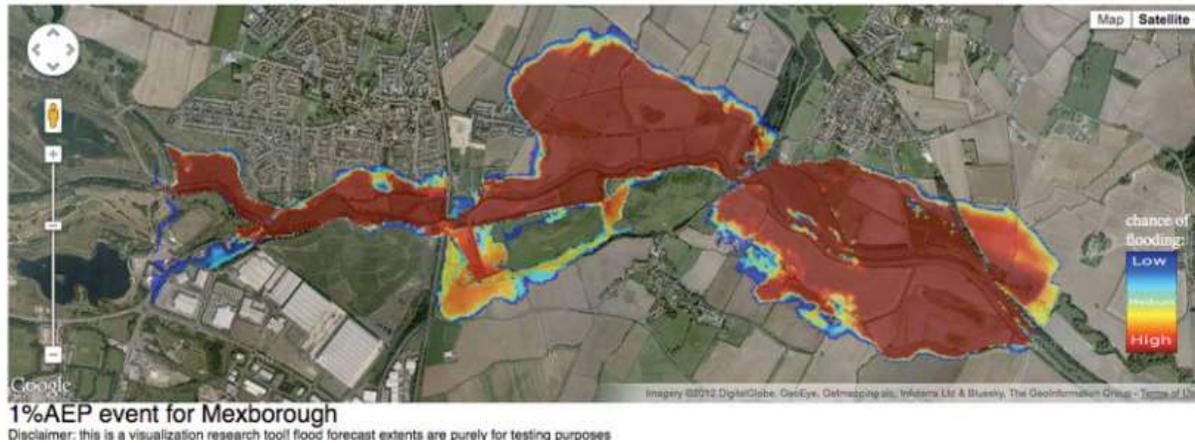
We need to move from deterministic to probabilistic mapping:



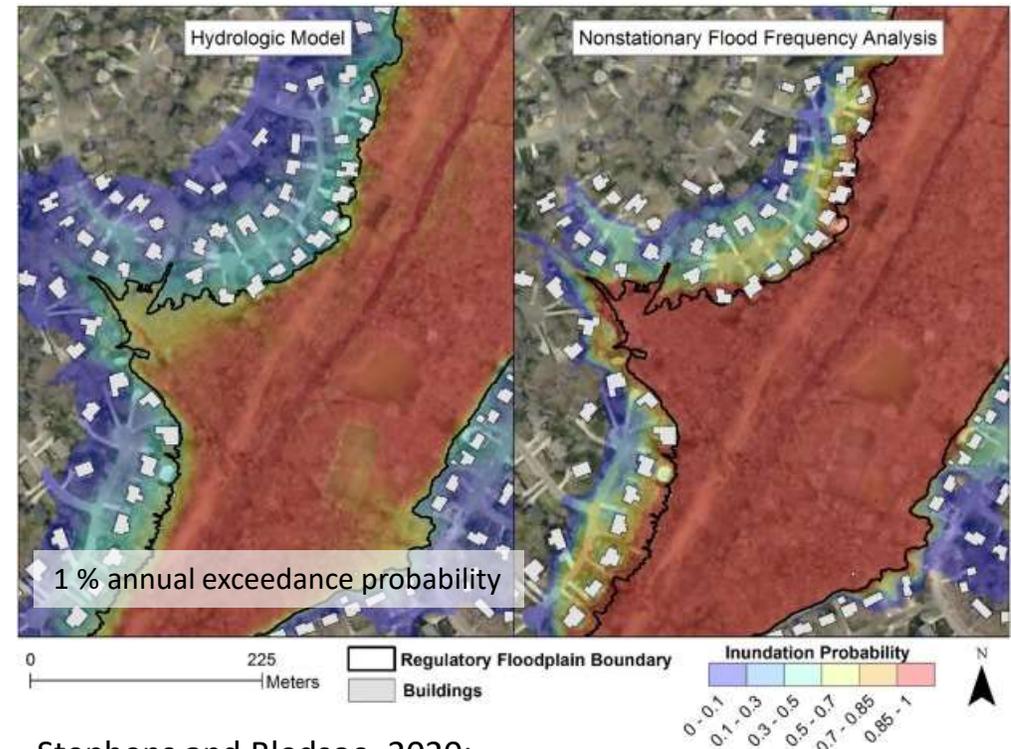
Alfonso et al. 2016: [doi:10.1002/2015WR017378](https://doi.org/10.1002/2015WR017378)

***What are the priorities for mapping flood risk with uncertainty?***

# How do we communicate risk with uncertainty?



Beven et al. 2015: [doi:10.1080/15715124.2014.917318](https://doi.org/10.1080/15715124.2014.917318)



Stephens and Bledsoe, 2020:  
[doi:10.1016/j.ancene.2019.100231](https://doi.org/10.1016/j.ancene.2019.100231)

***What are the priorities for mapping flood risk with uncertainty?***

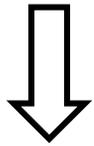
# How are we approaching this?

- Four PhD projects:
  - Current
    - Andrea Pozo Estivariz: *Advancing methods of rapid flood risk scenario assessment using hybrid approaches of hydraulic modelling and machine learning*
    - Martin Nguyen: *Advancing methods of uncertainty estimation in flood inundation modelling using machine learning approaches*
  - Recruiting now
    - *Implications of uncertainty in flood hazard assessments for planning under climate change*
    - *Building future urban development scenarios into assessments of future flood risk*
- Plus two masters projects, to be established later this year

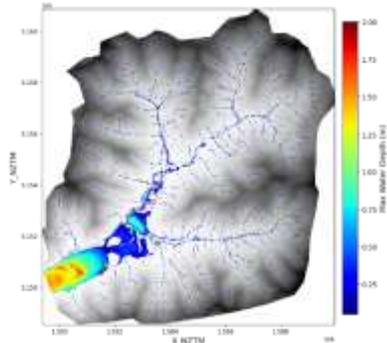
# Motivation

Current computer power limits flood risk assesment:

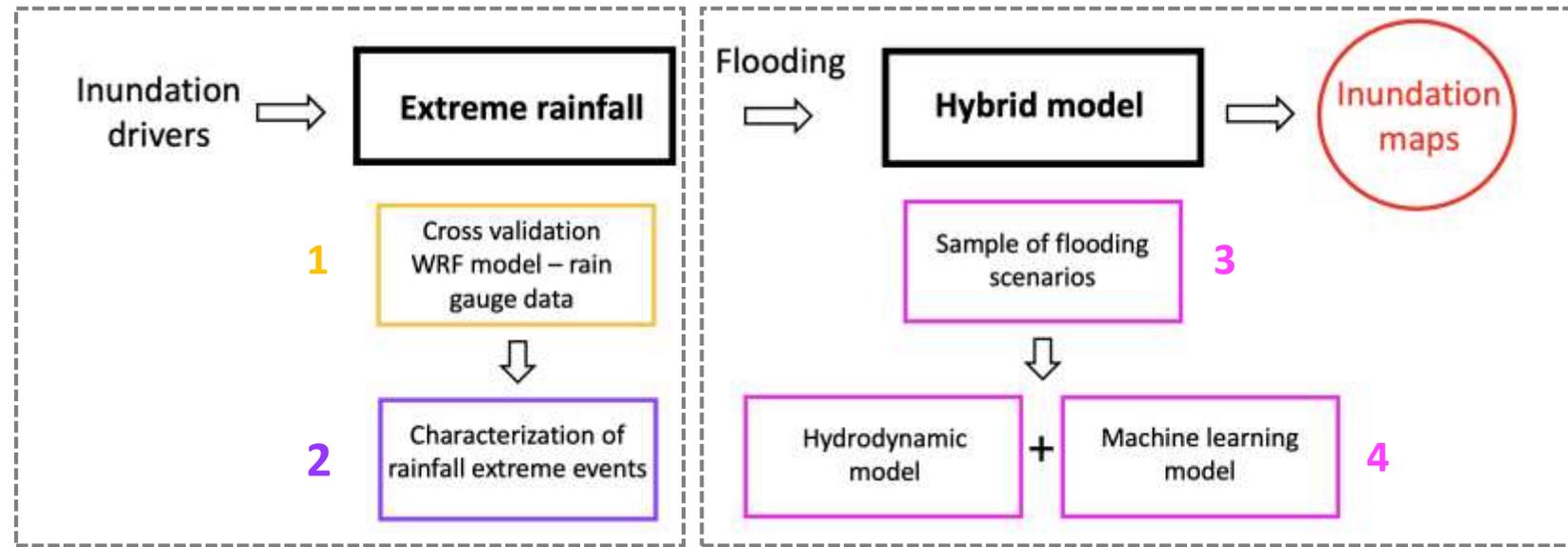
- Number of scenarios
- Level of detail and complexity of the model
- Catchment size



Fast, efficient and accurate tool for flood risk assesment



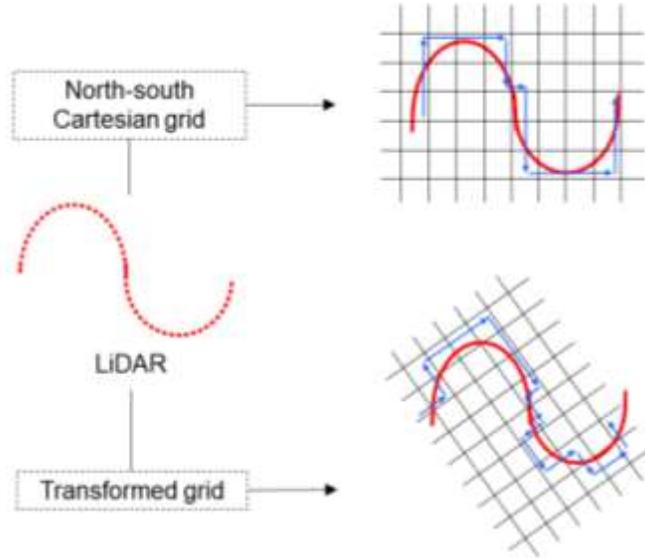
# Research outline



Andrea

# UNCERTAINTY IN PREDICTIONS OF FLOOD INUNDATION CAUSED BY MODEL GRID SAMPLING

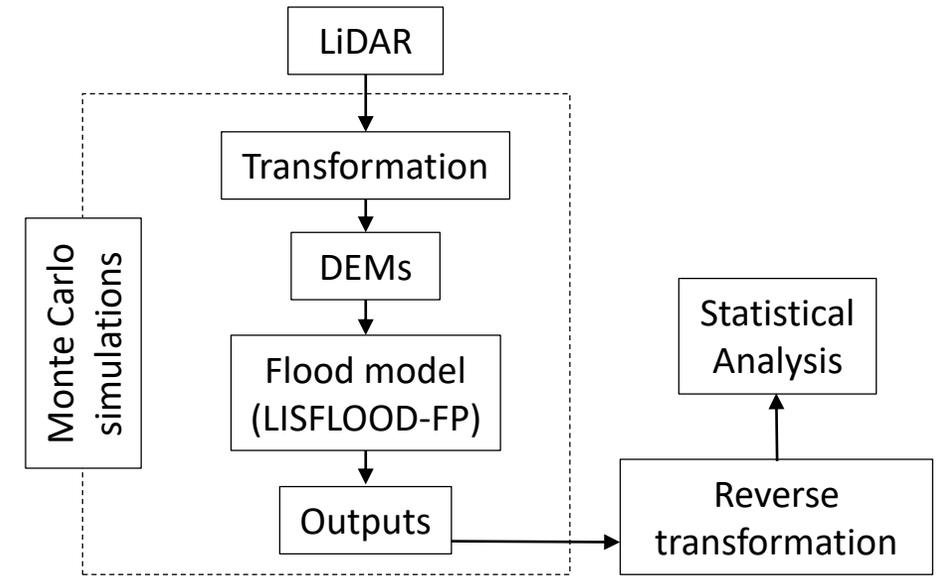
## Problem idea



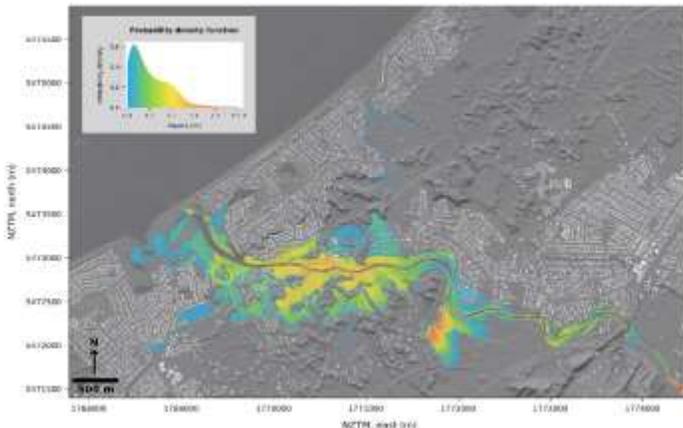
*North-south grid* is usually employed **without considering sampling** issues

*Transformed grid* orientation can **lead to variability** in topographic representation

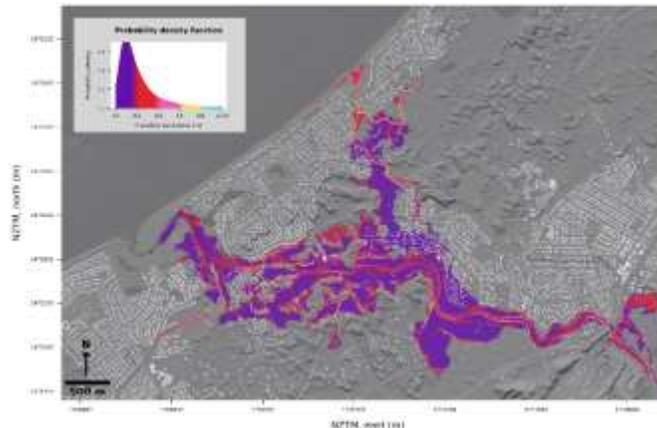
## Methodology



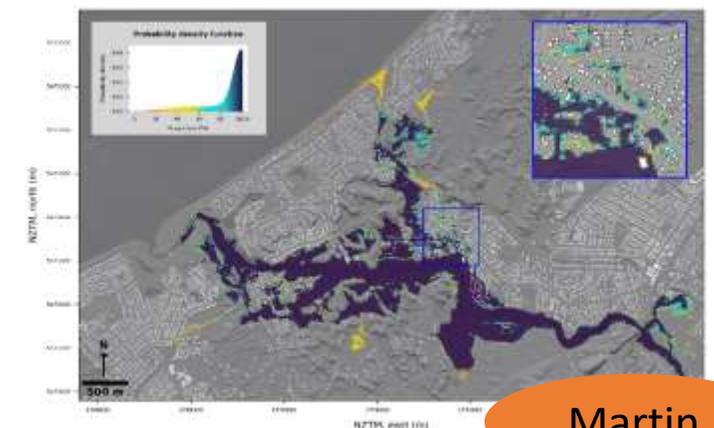
## Results when rotating and translating the grid



MEAN



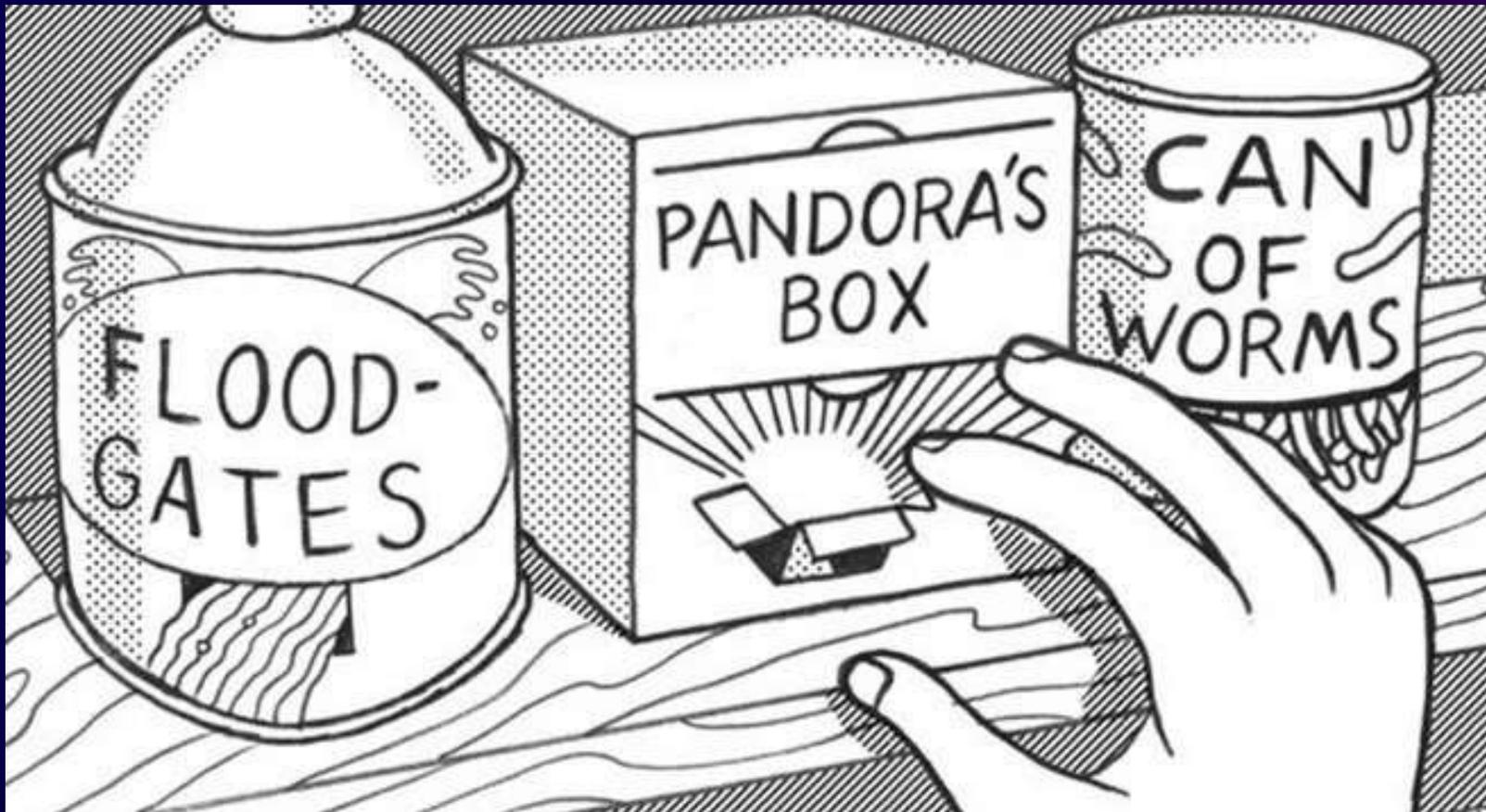
STANDARD DEVIATION



PROPORTION

Martin

What does uncertainty mean to you?



# What does uncertainty mean to you?



Quick poll: *In the context of flood risk, how does uncertainty affect your work and how is it accounted for?*

**Join at [slido.com](https://www.slido.com), #1141 111**

Poll direct link: <https://app.sli.do/event/uHgJUTXFLLkoewoqPCDmWc>

Results link: <https://wall.sli.do/event/uHgJUTXFLLkoewoqPCDmWc?section=73b7c31d-1171-4eba-810d-dffb1ebcb52d>

# Questions for (quick) discussion

Q1. How does your organisation deal with the uncertainty when communicating flood risk or activities related to flood hazard?

Q2. How could our programme outputs help to improve your organisations communications regarding risk and uncertainty?

- How can uncertainty be represented on flood maps/ communications most effectively? What statistics should be selected?